

APPENDIX C2 IMPACTS OF THE NO-PROJECT ALTERNATIVE RELATIVE TO EXISTING CONDITIONS

This appendix provides a qualitative analysis of potential effects on aquatic resources under the No-Project Alternative, relative to Existing Conditions. Although the following topical outline is consistent for analysis of all alternatives, effects in several issue areas are not anticipated to occur under the No-Project Alternative. From an aquatic resources perspective, there are only a few differences between Existing Conditions and the No-Project Alternative. (See Section 3.3, Description of Alternatives Under Consideration, for a detailed description of the No-Project Alternative, and Section 4.4, Aquatic Resources, for a detailed description of Existing Conditions.)

Qualitative analyses of potential effects on aquatic resources were performed using the methodology described in Appendix C1, Aquatic Resources Methodology. These analyses evaluated reservoir surface elevations, flow releases from the Oroville Facilities, blockage of gravel and large woody debris (LWD) recruitment in the lower Feather River, water quality criteria for aquatic life, predation, straying, Chinook salmon genetic introgression and redd superimposition, water temperature in the lower Feather River, and availability of fish species habitat.

Although future operations of the Oroville Facilities are expected to differ from Existing Conditions, some effects of the No-Project Alternative on aquatic resources—such as potential effects on predation and salmonid adult straying—are not expected to differ from those that would occur under Existing Conditions. Detailed descriptions of the effects of Oroville Facilities operations on predation and salmonid adult straying are provided in Appendix G-AQUA1 of the Preliminary Draft Environmental Assessment (PDEA).

C2.1 HABITAT COMPONENTS AFFECTED BY THE OROVILLE FACILITIES

C2.1.1 Chinook Salmon Spawning Segregation

Under the No-Project Alternative, the Oroville Facilities would continue to block the upstream migration of anadromous salmonids into historical spawning habitat in Lake Oroville's upstream tributaries, which would continue to result in an overall reduction of total available salmonid spawning habitat. The existing lack of access to historical upstream conditions would continue to affect natural selection processes, eventually resulting in effects on the genetic characteristics of the fish species.

In addition, with continued restricted access to historic spawning grounds, spring-run Chinook salmon would continue to spawn in the same lowland reaches that fall-run Chinook salmon use. Continued geographic overlap in spawning habitat between spring-run and fall-run Chinook salmon and the inter-breeding between these runs would result in the continued incremental degradation of the genetic distinctness between the runs.

The Fish Barrier Dam would continue to block upstream migration of anadromous salmonids and increase the intensity of habitat use in the Low Flow Channel (LFC). This increased intensity of habitat use would continue to cause increased competition for spawning habitat and continue to contribute to increased adult pre-spawning mortality rates and redd superimposition rates, which contribute to egg and alevin mortality. (See Section G-AQUA1.8, Tasks 2B, 2C, and 2D, in Appendix G-AQUA1 of the PDEA for additional information on salmonid life stages and associated project effects.)

Under the No-Project Alternative, the increased intensity of existing habitat use would continue and likely would cause additional incremental effects on spring-run and fall-run Chinook salmon genetic introgression, adult pre-spawning mortality, and redd superimposition rates.

C2.1.2 Macroinvertebrate Populations

Under the No-Project Alternative, operation of the Oroville Facilities likely would continue to incrementally contribute to the reduction of macroinvertebrate species diversity and abundance in the lower Feather River. Study Plan (SP) F1 (see Section G-AQUA1.1 in Appendix G-AQUA1 of the PDEA) provides a detailed description of the current effects of the Oroville Facilities on macroinvertebrate communities. The existing blockage of LWD and gravel transport to the lower Feather River would continue to decrease the quality, quantity, and diversity of macroinvertebrate habitat.

C2.1.3 Woody Debris Recruitment

Under the No-Project Alternative, the Oroville Facilities would continue to block the upstream contribution of LWD to the lower Feather River. (See Section 5.1, Geology, Soils, and Paleontological Resources, of the draft environmental impact report (DEIR) for additional information on LWD recruitment.) The lowest proportion of LWD availability likely would continue to occur in the LFC. Downstream of the Thermalito Afterbay Outlet, the river likely would continue to support a greater availability of LWD cover than the reach upstream of the outlet because opportunities for LWD recruitment likely would remain higher in the High Flow Channel (HFC). The existing blockage of LWD to the lower Feather River would result in a continued incremental degradation of the quantity and quality of LWD present in the lower Feather River and would result in reduced quality and diversity of habitat for aquatic resources.

C2.1.4 Gravel Recruitment

Under the No-Project Alternative, Oroville Dam, the Thermalito Diversion Dam, and the Fish Barrier Dam would continue to block gravel contribution from the upper Feather River watershed to the lower Feather River. (See Section 5.1, Geology, Soils, and Paleontological Resources, of the DEIR for additional information on gravel recruitment and lower Feather River substrate conditions.) High Oroville Facilities releases, such as those implemented for flood management purposes, would continue to mobilize smaller substrate particle sizes. Consequently, a gradual relative coarsening of the particle size

distribution of the substrate in the upper portions of the lower Feather River also would continue. Currently, the reach of river with the highest proportion of coarse substrate components is the portion of the lower Feather River below the Fish Barrier Dam and above the Thermalito Afterbay Outlet. Under the No-Project Alternative, the upper reaches of the lower Feather River likely would become more armored, resulting in an incremental detrimental effect on the quality and quantity of suitable salmonid spawning gravels in the lower Feather River.

In addition to reduced gravel recruitment, fine sediments also would continue to become trapped upstream of the Oroville Facilities. Currently, more than 97 percent of the sediment from the upstream watershed is trapped in Oroville Facilities reservoirs, resulting in sediment deprivation downstream. (See Section 5.1, Geology, Soils, and Paleontological Resources, for additional information on sediment recruitment.) Only very fine sediment is discharged from Lake Oroville to the lower Feather River. The existing deprivation of the sediment load in the lower Feather River results in reduced formation of sediment benches, which affects riparian vegetation colonization and succession (see the discussion of botanical resources in Section 5.5, Terrestrial Resources, of the DEIR for additional information on riparian vegetation). Riparian vegetation provides overhanging cover for rearing fish, riparian shade, invertebrate contributions to the fish food base, and future LWD contributions. Additionally, soft sediment substrates contribute to the capture and retention of LWD. Therefore, under the No-Project Alternative, a continued lack of sediment recruitment to the lower Feather River would result in the incremental degradation of geomorphic processes, contributing to a decrease in the quality and diversity of habitat for aquatic resources in the lower Feather River.

C2.1.5 Channel Complexity

Under the No-Project Alternative, channel complexity would be reduced through continued riverbed incision and channel confinement. (See Section 5.1, Geology, Soils, and Paleontological Resources, for additional information on channel complexity.) Continued operation of the Oroville Facilities with relatively static and moderated flow regimes in the LFC under the No-Project Alternative likely would continue to limit the geomorphic processes that result in channel complexity, resulting in the ongoing incremental degradation of the quality and diversity of aquatic resource habitat relative to Existing Conditions.

C2.1.6 Water Quality Criteria for Aquatic Life

Operation of the Oroville Facilities under the No-Project Alternative is not expected to result in any changes to water quality conditions for aquatic life. Therefore, the number of exceedances of water quality criteria for aquatic life is not expected to change relative to Existing Conditions; see Section 4.4, Aquatic Resources.

C2.2 WARMWATER RESERVOIR FISHERIES

C2.2.1 Operations-Related Effects

C2.2.1.1 Spawning and Initial Rearing

Under the No-Project Alternative, changes in Oroville Reservoir water surface elevations and rates of reduction would occur, relative to Existing Conditions, because reservoir operations would be modified to reflect changes in future water supply demand patterns. (See Section 5.2.1, Surface Water Quantity, for additional information on changes in demand patterns, reservoir operations, and water surface elevations.) However, there would be no appreciable change in the rate of Lake Oroville surface elevation reductions during the March through June bass nesting period; therefore, no appreciable change in the rate of bass nest dewatering in Lake Oroville is anticipated under the No-Project Alternative, relative to Existing Conditions. Thermalito Afterbay operation and resulting water surface elevation fluctuations would not change under the No-Project Alternative; therefore, no change in the rate of bass nest dewatering within the Thermalito Afterbay is anticipated.

C2.2.1.2 Fish Interactions

Under the No-Project Alternative, stocked salmonid species and warmwater fish species within Lake Oroville could potentially continue to interact with upstream tributary fisheries through predation, competition for food and habitat, disease transmission, and genetic introgression. (See Section G-AQUA1.5, Task 1, in Appendix G-AQUA1 of the PDEA for additional information on potential fisheries interactions.) Lake Oroville reservoir operations would continue to influence the accessibility of the upstream tributaries to fish species within Lake Oroville through changes in reservoir water surface elevations. When Lake Oroville water surface elevations are near full pool, Big Bend Dam becomes passable to fish. Conversely, when reservoir stage elevations are reduced, sediment wedges in the tributary arms of the reservoir may be exposed and may inhibit or prohibit fish movement from the reservoir into the upstream tributaries. Increases or decreases in reservoir stage elevations also would increase or decrease the distance from the reservoir to habitat in the upstream tributaries above the reservoir high-pool mark, which also could influence the amount and frequency of interactions between reservoir fishes and fishes in the upstream tributaries.

The Oroville Facilities would continue to influence fish species interactions and sediment wedge locations in the upstream tributaries and reservoir arms, respectively. However, the nature and relative effect of the reservoir surface elevations are not expected to change with implementation of the No-Project Alternative relative to Existing Conditions.

No changes in fish stocking or in the frequency or nature of sediment wedge exposure associated with Lake Oroville water surface elevations are anticipated. Therefore, no effects on warmwater reservoir fish interactions are expected under the No-Project Alternative.

C2.2.2 Fisheries Management–Related Effects

C2.2.2.1 Stocking

No changes in warmwater fish stocking or the existing habitat enhancement program are anticipated under the No-Project Alternative.

C2.2.2.2 Disease

No changes in the types or transmission rates of warmwater fish diseases are anticipated under the No-Project Alternative.

C2.2.2.3 Recreational Access or Fishing Regulations

As described in Section 5.7 of the DEIR, Recreational Resources, a one-third increase in recreation and angling activities under the No-Project Alternative is anticipated. A one-third increase in angling coupled with no other fisheries changes would equate to increased sport fish harvest rates and potentially result in reduced catch sizes and catch rates. No changes in fishing access or regulations for warmwater sport fishing are anticipated under the No-Project Alternative.

C2.2.3 Summary of Potential Effects on Warmwater Reservoir Fisheries

The quality of the warmwater sport fishery would be reduced under the No-Project Alternative by increased angling and resulting reduced catch rates and sizes. Increased warmwater sport fish harvest rates could potentially affect population sustainability under the No-Project Alternative.

C2.3 COLDWATER RESERVOIR FISHERIES

C2.3.1 Operations-Related Effects

C2.3.1.1 Habitat Availability

Under the No-Project Alternative, changes in reservoir water surface elevations and drawdown rates during the summer months (see Section 5.2.1, Surface Water Quantity, of the DEIR) likely would not affect the availability of coldwater habitat in Lake Oroville. Oroville Facilities reservoir water surface elevations are not expected to reach sufficiently low elevations to affect the amount of suitable coldwater fisheries habitat availability below the thermocline. Additionally, drawdown rates are not expected to be sufficiently rapid to cause reservoir mixing. Water temperature management targets for the Feather River Fish Hatchery and Robinson Riffle would not change under the No-Project Alternative. Therefore, release of the coldwater pool from Lake Oroville, and the resulting relative quantity of suitable coldwater fisheries habitat, is not expected to change under the No-Project Alternative, relative to Existing Conditions. For these reasons, Oroville Facilities operations under the No-Project Alternative likely would have no effect on the availability of coldwater fisheries habitat in Lake Oroville.

Operations of Thermalito Afterbay would not change under the No-Project Alternative. Therefore, there are no anticipated effects on the availability of coldwater habitat, relative to Existing Conditions.

C2.3.1.2 Fish Interactions

No changes in fish stocking or in the frequency or nature of sediment wedge exposure associated with Lake Oroville water surface elevations are anticipated under the No-Project Alternative. (See Appendix C1 and Section C2.2.1.2, Fish Interactions, above, for further discussion.) Therefore, no effects on coldwater reservoir fish interactions are expected relative to Existing Conditions under the No-Project Alternative.

C2.3.2 Fisheries Management–Related Effects

C2.3.2.1 Stocking

No changes in existing coldwater fish stocking are anticipated under the No-Project Alternative.

C2.3.2.2 Disease

No changes in the incidence of disease are anticipated under the No-Project Alternative.

C2.3.2.3 Recreational Access or Fishing Regulations

A one-third increase in recreation and angling activities is anticipated under the No-Project Alternative (see Section 5.7, Recreational Resources). A one-third increase in angling with no other fisheries changes would equate to increased sport fish harvest rates and potentially result in reduced catch sizes and catch rates. No changes to recreational access or fishing regulations are anticipated under the No-Project Alternative.

C2.3.3 Summary of Potential Effects on Coldwater Reservoir Fisheries

The quality of the coldwater sport fishery would be reduced in the No-Project Alternative as a result of increased angling and resulting reduced catch rates and sizes.

C2.4 LOWER FEATHER RIVER FISH SPECIES

Qualitative analyses were performed on various potential effects resulting from Oroville Facilities operations under the No-Project Alternative to determine the incremental effects of continued operations relative to Existing Conditions. The results of the detailed quantitative analysis conducted as part of the PDEA are utilized to assist in qualitatively evaluating effects of changes to flow regimes and water temperatures in the lower Feather River.

C2.4.1 Fall-run Chinook Salmon

Study plan report summaries addressing project-related effects on fall-run Chinook salmon are presented in Section G-AQUA1.5, Fisheries Management; Section G-AQUA1.7, Feather River Fish Hatchery; Section G-AQUA1.8, Salmonids and Their Habitat in the Feather River Below the Fish Barrier Dam; Section G-AQUA1.9, Upstream Fish Passage; Section G-AQUA10, Instream Flows and Fish Habitat; and Section G-AQUA1.11, Predation, in Appendix G-AQUA1, Affected Environment, of the PDEA. A description of each fall-run Chinook salmon life stage and the time period associated with it is presented in Appendix C1.

C2.4.1.1 Flow-Related Effects

Under the No-Project Alternative, there would be no changes in flows in the LFC relative to Existing Conditions. Effects of flow changes in the HFC are expressed in the qualitative analyses presented below.

Adult Immigration and Holding

Mean monthly flow changes under the No-Project Alternative compared to Existing Conditions during the fall-run Chinook salmon adult immigration and holding period would occur in the HFC. Increased mean monthly flows during July and August and decreased mean monthly flows for the remainder of the immigration and holding period would cause small changes in river stage elevation. Because the flow-related changes in river stage elevation during the Chinook salmon adult immigration and holding period would be small, they would not affect immigration at potential critical riffles and would not be sufficiently large to appreciably affect holding habitat depths.

Flow fluctuations that could potentially occur under the No-Project Alternative would be similar to flow fluctuations that occur under Existing Conditions. Because flow fluctuations currently do not affect fall-run Chinook salmon adult immigration and holding (DWR 2003a, 2003b), flow fluctuation under the No-Project Alternative also would not affect fall-run Chinook salmon adult immigration and holding.

Adult Spawning and Embryo Incubation

Under the No-Project Alternative, minimum instream flows in the LFC would remain at 600 cubic feet per second (cfs) year-round. Flow fluctuations that could potentially occur under the No-Project Alternative would be similar to flow fluctuations that occur under Existing Conditions.

Evaluation of the Weighted Usable Area (WUA) index generated by the physical habitat simulation (PHABSIM) model for the adult spawning life stage of Chinook salmon indicated that the maximum amount of spawning area in the LFC, given the current channel configuration, would occur at flows from 800 to 825 cfs (DWR 2004a). Figure C2.4-1 shows the WUA curve generated by the PHABSIM model for Chinook salmon spawning in the LFC.

Current flows in the LFC during the fall-run Chinook salmon spawning period are 600 cfs, which, according to PHABSIM model results, correspond to approximately 91 percent of maximum WUA. Because proposed flows in the LFC under the No-Project Alternative would be the same as Existing Conditions, flows under the No-Project Alternative also would result in approximately 91 percent of maximum WUA, representing no change from Existing Conditions.

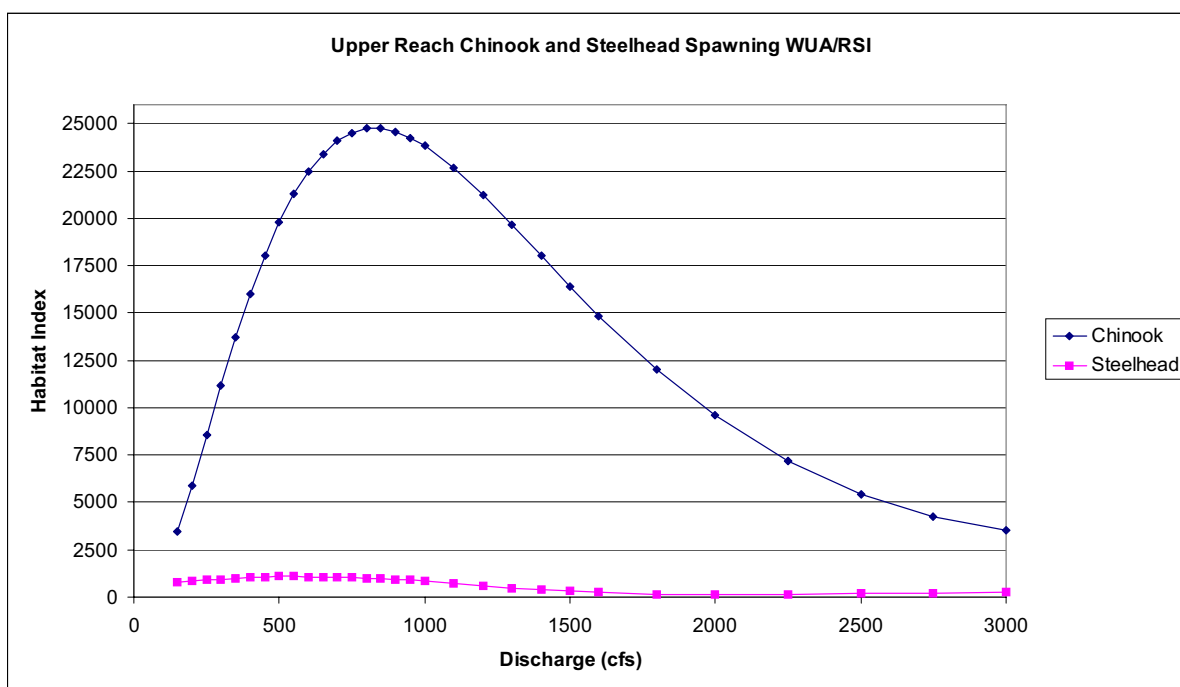


Figure C2.4-1. Low Flow Channel WUA curves for steelhead and Chinook salmon.

Under the No-Project Alternative, flow fluctuations in the HFC are not expected to differ from flow fluctuations that occur under Existing Conditions. However, flow releases likely would change on a monthly basis compared to Existing Conditions; see Section 5.2.1, Water Quantity. Daily minimum and maximum flows within the fall-run Chinook salmon spawning period would not differ from those described in the 1983 agreement between the California Department of Fish and Game (DFG) and California Department of Water Resources (DWR), which governs current operations. Under Existing Conditions, during normal operations, flows in the HFC are maintained above specified minimum and below specified maximum flows, in part, to protect fisheries resources in the lower Feather River. Flow requirements for the HFC under Existing Conditions and the No-Project Alternative are described in Section 5.2.1, Surface Water Quantity. Under normal operating conditions the No-Project Alternative daily releases into the HFC would not fluctuate outside the minimum and maximum flows described in Section 5.2.1, Surface Water Quantity, which are the same minimum and maximum flow requirements described for Existing Conditions.

During drought conditions, flows under the No-Project Alternative would be lowered to a constant minimum flow of 750 cfs prior to the onset of fall-run Chinook salmon spawning and raised to 900 cfs in early October. According to the U.S. Bureau of Reclamation (USBR 2004), the minimum and maximum flow requirements, as well as the fluctuations allowed in the HFC under Existing Conditions during the fall-run Chinook salmon spawning and embryo incubation period, have not affected this life stage. Therefore, it is expected that the flow requirements and the associated flow fluctuations that would occur in the HFC under the No-Project Alternative also would not affect this life stage.

Evaluation of the WUA index generated by the PHABSIM model for the adult spawning life stage of Chinook salmon indicated that the maximum amount of spawning area in the HFC, given the current channel configuration, would occur at flows between 1,650 and 1,750 cfs (DWR 2004a). Figure C2.4-2 shows the WUA curve generated by the PHABSIM model for Chinook salmon spawning in the HFC.

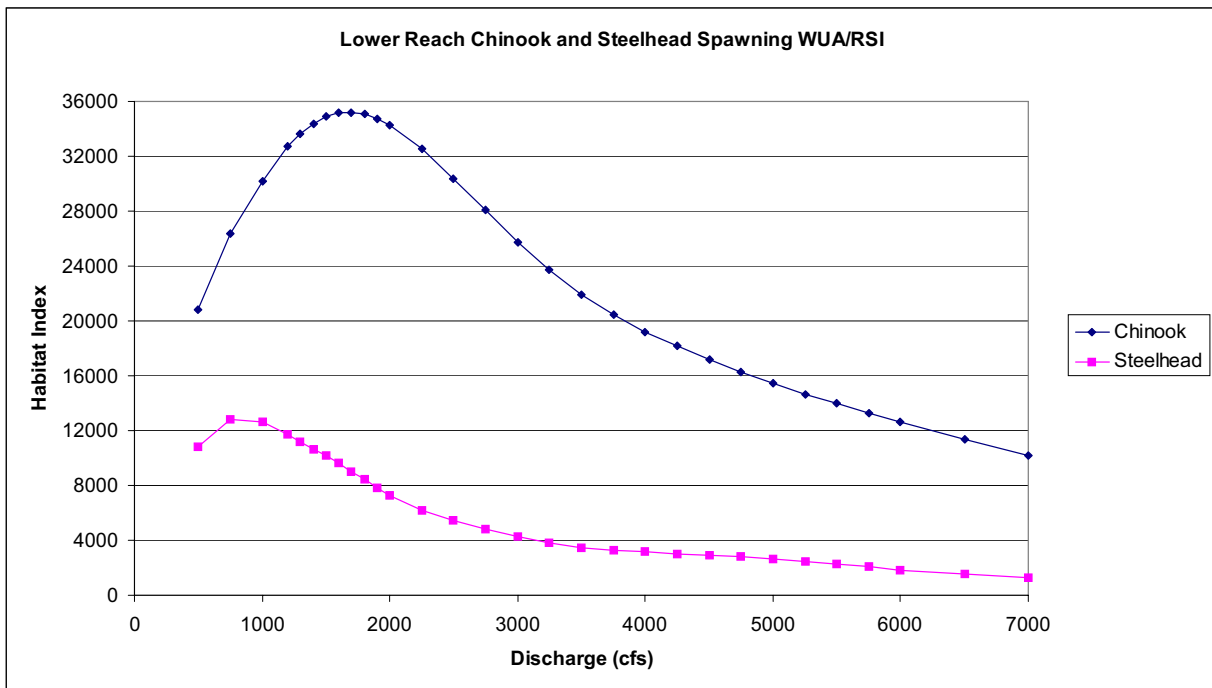


Figure C2.4-2. High Flow Channel WUA curves for steelhead and Chinook salmon.

Current minimum flows in the HFC during the fall-run Chinook salmon spawning period are 1,000 cfs during September and 1,700 cfs during October, November and December, which produce approximately 86 percent and 100 percent of maximum WUA, respectively. Minimum flows under the No-Project Alternative likely would not change from Existing Conditions. Therefore, minimum flows in the HFC under the No-Project Alternative also would produce approximately 86 percent of maximum WUA during September and 100 percent of maximum WUA for Chinook salmon spawning from October through December, representing no change from Existing Conditions.

Juvenile Rearing and Downstream Movement

Under the No-Project Alternative, flow fluctuations in the HFC would be similar to those occurring under Existing Conditions. Because flow fluctuations under Existing Conditions do not measurably affect juvenile fall-run Chinook salmon, it is expected that flow fluctuations occurring under the No-Project Alternative also would have no measurable effect on fall-run Chinook salmon juvenile rearing and downstream movement, relative to Existing Conditions.

C2.4.1.2 Water Temperature–Related Effects

Effects of water temperature changes associated with the No-Project Alternative are expressed in the qualitative analyses presented below. These analyses are qualitative in nature, but anticipated changes in water temperature under the No-Project Alternative likely would be similar to those found with the detailed quantitative analyses of the No-Action Alternative provided in the PDEA.

Adult Immigration and Holding

Flows and water temperatures in the LFC are anticipated to be similar under the No-Project Alternative to those under Existing Conditions. Flows in the HFC would increase slightly during July and August and decrease slightly during the rest of the adult immigration and holding life stage period. Slight changes in water temperatures likely would occur as a result of the slight changes in flows. However, the PDEA analysis of habitat suitability indicated a less than one percent difference in habitat suitability occurred with implementation of the No-Action Alternative, relative to Existing Conditions. Because water temperatures are similar under the PDEA alternatives to water temperatures under the DEIR alternatives, the slight changes in water temperatures associated with implementation of the No-Project Alternative are expected to result in a similarly small change in fall-run Chinook salmon adult immigration and holding habitat suitability, relative to Existing Conditions.

Adult Spawning and Embryo Incubation

Flows and water temperatures in the LFC, where most Chinook salmon spawning occurs, are anticipated to be the same under the No-Project Alternative as those observed under Existing Conditions. Flows in the HFC may change slightly as water supply demand patterns shift in future years (i.e., 2020 level of development). However, the analysis of spawning and embryo incubation habitat suitability provided in the PDEA indicated less than one percent difference in habitat suitability occurred with implementation of the No-Action Alternative, relative to Existing Conditions. Because water temperatures are similar under the PDEA alternatives to water temperatures under the EIR alternatives, the slight changes in water temperatures associated with implementation of the No-Project Alternative are expected to result in a similarly small change in fall-run Chinook salmon adult spawning and embryo incubation habitat suitability, relative to Existing Conditions.

Juvenile Rearing and Downstream Movement

Flows and water temperatures in the LFC are anticipated to be the same under the No-Project Alternative as those observed under Existing Conditions. Flows in the HFC may change slightly as water supply demand patterns shift. However, the PDEA analysis of juvenile rearing and downstream movement habitat suitability indicated less than one percent difference occurred with implementation of the No-Action Alternative, relative to Existing Conditions. Because water temperatures are similar under the PDEA alternatives to water temperatures under the EIR alternatives, the slight changes in water temperatures associated with implementation of the No-Project Alternative are expected to result in a similarly small change in fall-run Chinook salmon juvenile rearing and downstream movement habitat suitability, relative to Existing Conditions.

C2.4.1.3 Predation-Related Effects

The slight change in water temperatures resulting from slight changes in seasonal flow patterns in the HFC under the No-Project Alternative is not anticipated to affect predation rates or the composition of predator species.

C2.4.1.4 Fisheries Management–Related Effects

Hatchery

No changes to hatchery management practices are anticipated under the No-Project Alternative. Therefore, no hatchery-related effects on fall-run Chinook salmon are expected.

Disease

The slight change in water temperatures resulting from slight changes in seasonal flow patterns in the HFC under the No-Project Alternative is not anticipated to affect the incidence of disease in fall-run Chinook salmon in the lower Feather River.

Fishing Regulations, Poaching, and Change in Recreational Access and Visitation

Section 5.7, Recreational Resources, forecasts a one-third increase in recreation and angling activities with implementation of the No-Project Alternative. This increase in angling, with no other protective measures related to fisheries, likely would result in increased sport fish harvest rates. No changes to fishing regulations are anticipated to occur under the No-Project Alternative, which could result in a negative effect on the Chinook salmon natural spawning population.

C2.4.1.5 Summary of Potential Effects on Fall-run Chinook Salmon

Adult Immigration and Holding

Changes in flows and water temperatures under the No-Project Alternative would not affect fall-run Chinook salmon adult immigration and holding. Modeling conducted as

part of the PDEA indicated that differences in habitat suitability due to decreased water temperatures are less than one percent between Existing Conditions and the No-Action Alternative, which would be similar to decreased habitat suitability associated with implementation of the No-Project Alternative. Therefore, changes in water temperatures would not affect fall-run Chinook salmon adult immigration and holding.

Overall, operation of the Oroville Facilities under the No-Project Alternative would result in no effect on fall-run Chinook salmon adult immigration and holding.

Adult Spawning and Embryo Incubation

Changes in mean monthly flows in the HFC under the No-Project Alternative would result in no effect on fall-run Chinook salmon adult spawning and embryo incubation. The minor changes in water temperature expected under the No-Project Alternative would not affect fall-run Chinook salmon adult spawning and embryo incubation. However, continued degradation of gravel spawning substrate in the lower Feather River would result in an adverse effect on fall-run Chinook salmon adult spawning and embryo incubation by reducing the quantity and quality of available habitat. Also, continued utilization of the same spawning areas and ongoing inter-breeding between the two runs would continue to incrementally degrade the genetic distinctness between spring-run and fall-run Chinook salmon in the lower Feather River.

Overall, operation of the Oroville Facilities under the No-Project Alternative would result in an adverse effect on fall-run Chinook salmon adult spawning and embryo incubation.

Juvenile Rearing and Downstream Movement

Changes in average monthly flows and water temperatures under the No-Project Alternative are not expected to affect fall-run Chinook salmon juvenile rearing and downstream movement. However, continued blockage of LWD and gravel, and the degradation of side-channel habitat quality would result in an adverse effect on the quality and quantity of available habitat.

Overall, operation of the Oroville Facilities under the No-Project Alternative would have an adverse effect on fall-run Chinook salmon juvenile rearing and downstream movement.

Conclusion

Based on the above summary of potential effects, it is expected that the No-Project Alternative would have an overall adverse effect on fall-run Chinook salmon, relative to Existing Conditions.

C2.4.2 Spring-run Chinook Salmon

Study plan report summaries addressing project effects on spring-run Chinook salmon are presented in Section G-AQUA1.5, Fisheries Management; Section G-AQUA1.7, Feather River Fish Hatchery; Section G-AQUA1.8, Salmonids and Their Habitat in the

Feather River Below the Fish Barrier Dam; Section G-AQUA1.9, Upstream Fish Passage; Section G-AQUA10, Instream Flows and Fish Habitat; and Section G-AQUA1.11, Predation, in Appendix G-AQUA1, Affected Environment of the PDEA. A description of each spring-run Chinook salmon life stage and the time period associated with it is presented in Appendix C1.

C2.4.2.1 Flow-Related Effects

Under the No-Project Alternative, there would be no changes to flows in the LFC. Effects of flow changes in the HFC are expressed in the qualitative analyses of habitat suitability presented below.

Adult Immigration and Holding

Mean monthly flow changes would occur in the HFC during the spring-run Chinook salmon adult immigration and holding period under the No-Project Alternative, relative to Existing Conditions. Increased mean monthly flows from May through August and decreased mean monthly flows in March and April, and in September and October would cause very small changes in river stage. Because the flow-related changes in river stage during the spring-run Chinook salmon adult immigration and holding period would be small, they would not affect immigration at potential critical riffles and would not appreciably affect holding habitat depths.

Flow fluctuations that could potentially occur under the No-Project Alternative would be similar to flow fluctuations that occur under Existing Conditions. Because flow fluctuations currently do not affect spring-run Chinook salmon adult immigration and holding (DWR 2003a, 2003b), flow fluctuations under the No-Project Alternative also would not affect spring-run Chinook salmon adult immigration and holding.

Adult Spawning and Embryo Incubation

Refer to the above discussion in Section C2.4.1 for the evaluation of flow-related effects on spring-run Chinook salmon adult spawning and embryo incubation.

Juvenile Rearing and Downstream Movement

Under the No-Project Alternative, flow fluctuations in the HFC would be similar to those occurring under Existing Conditions. Because flow fluctuations under Existing Conditions do not measurably affect juvenile spring-run Chinook salmon, it is expected that flow fluctuations occurring under the No-Project Alternative also would have no measurable effect on spring-run Chinook salmon juvenile rearing and downstream movement, relative to Existing Conditions.

C2.4.2.2 Water Temperature-Related Effects

Effects of water temperature changes associated with the No-Project Alternative are expressed in the qualitative analyses of relative habitat suitability presented below.

Adult Immigration and Holding

No changes in water temperatures are anticipated in the LFC with implementation of the No-Project Alternative relative to Existing Conditions. Modeling conducted as part of the PDEA analyses showed slight decreases in water temperature in the HFC associated with the No-Action Alternative and, as such, slightly lower water temperatures in the HFC are anticipated with implementation of the No-Project Alternative. Increased habitat suitability due to decreased water temperatures under the No-Project Alternative would provide a slight beneficial effect on spring-run Chinook salmon adult immigration and holding.

Adult Spawning and Embryo Incubation

Flows and water temperatures in the LFC, where most Chinook salmon spawning occurs, are anticipated to be the same under the No-Project Alternative as those observed under Existing Conditions. Flows in the HFC may change slightly as water supply demand patterns shift in future years (i.e., 2020 level of development). However, in the analyses conducted as part of the PDEA, differences in habitat suitability due to decreased water temperatures during the spring-run Chinook salmon adult spawning and embryo incubation period were less than one percent between existing conditions and the No-Action Alternative. Therefore, changes in water temperature associated with implementation of the No-Project Alternative would not affect spring-run Chinook salmon adult spawning and embryo incubation.

Juvenile Rearing and Downstream Movement

In the analyses conducted as part of the PDEA, differences in habitat suitability due to decreased water temperatures are less than one percent between existing conditions and the No-Action Alternative. Therefore, changes in water temperature under the No-Project Alternative would not affect spring-run Chinook salmon juvenile rearing and downstream movement.

C2.4.2.3 Predation-Related Effects

The slight changes in water temperatures resulting from slight changes in seasonal flow patterns in the HFC under the No-Project Alternative are not anticipated to affect predation rates or the composition of predator species.

C2.4.2.4 Fisheries Management-Related Effects

Hatchery

No changes to hatchery management are anticipated under the No-Project Alternative. Therefore, no hatchery-related effects on spring-run Chinook salmon are expected.

Disease

The slight change in water temperatures resulting from slight changes in seasonal flow patterns in the HFC under the No-Project Alternative is not anticipated to affect the incidence of disease in spring-run Chinook salmon in the lower Feather River.

Fishing Regulations, Poaching, and Change in Recreational Access and Visitation

Section 5.7 of the DEIR, Recreational Resources, forecasts a one-third increase in recreation and angling activities with implementation of the No-Project Alternative. This increase in angling, with no other fisheries management alterations, would result in increased sport fish harvest rates. No changes to fishing regulations are anticipated to occur under the No-Project Alternative. Therefore, a negative effect on Chinook salmon natural spawning population could occur.

C2.4.2.5 Summary of Potential Effects on Spring-run Chinook Salmon

Adult Immigration and Holding

Slight changes in flows under the No-Project Alternative would result in no effective change in spring-run Chinook salmon adult immigration and holding habitat quantity or quality. Increased habitat suitability due to decreased water temperatures under the No-Project Alternative would provide a slight beneficial effect on spring-run Chinook salmon adult immigration and holding. Increased angling and sport harvest would have an adverse effect on spring-run Chinook salmon adult immigration and holding.

Overall, operation of the Oroville Facilities under the No-Project Alternative would result in a slightly adverse effect on spring-run Chinook salmon adult immigration and holding.

Adult Spawning and Embryo Incubation

Changes in flows under the No-Project Alternative would have no effect on spring-run Chinook salmon adult spawning and embryo incubation. Differences in habitat suitability due to slightly decreased water temperatures during the spring-run Chinook salmon adult spawning and embryo incubation period would not affect spring-run Chinook salmon adult spawning and embryo incubation. Continued degradation of spawning gravel quality in the lower Feather River would result in an adverse effect on spring-run Chinook salmon adult spawning and embryo incubation by reducing the quality and quantity of available habitat. Also, continued utilization of the same spawning areas by spring-run and spring-run Chinook salmon and on-going inter-breeding of the two runs would continue to incrementally degrade the genetic distinctness of the Chinook salmon runs that spawn in the lower Feather River.

Overall, operation of the Oroville Facilities under the No-Project Alternative would result in an adverse effect on spring-run Chinook salmon adult spawning and embryo incubation.

Juvenile Rearing and Downstream Movement

Slight changes in flows and water temperatures under the No-Project Alternative are not expected to affect spring-run Chinook salmon juvenile rearing and downstream movement. However, continued blockage of LWD and gravel, and degradation of side-channel habitat quality in the upper reaches of the lower Feather River would result in an adverse effect on juvenile rearing and downstream movement.

Overall, operation of the Oroville Facilities under the No-Project Alternative would result in an adverse effect on spring-run Chinook salmon juvenile rearing and downstream movement.

Conclusion

Based on the above summary of potential effects, it is expected that the No-Project Alternative would have an overall adverse effect on spring-run Chinook salmon, relative to Existing Conditions.

C2.4.3 Steelhead

Study plan report summaries addressing project effects on steelhead are presented in Section G-AQUA1.5, Fisheries Management; Section G-AQUA1.7, Feather River Fish Hatchery; Section G-AQUA1.8, Salmonids and Their Habitat in the Feather River Below the Fish Barrier Dam; Section G-AQUA1.9, Upstream Fish Passage; Section G-AQUA10, Instream Flows and Fish Habitat; and Section G-AQUA1.11, Predation, in Appendix G-AQUA1, Affected Environment of the PDEA. A description of each steelhead life stage and the time period associated with it is presented in Appendix C1.

C2.4.3.1 Flow-Related Effects

Under the No-Project Alternative, there would be no changes to flows in the LFC. Effects of flow changes in the HFC are expressed in the qualitative analyses of habitat suitability presented below.

Adult Immigration and Holding

Mean monthly flow decreases under the No-Project Alternative compared to Existing Conditions during the steelhead adult immigration and holding period would occur in the HFC, which would cause very small changes in river stage. Because the flow-related changes in river stage during the steelhead adult immigration and holding period would be small, they would not affect immigration at potential critical riffles and would not appreciably affect holding habitat depths.

Flow fluctuations that could potentially occur under the No-Project Alternative would be similar to flow fluctuations that occur under Existing Conditions. Because flow fluctuations currently do not affect steelhead adult immigration and holding, flow fluctuations under the No-Project Alternative also would not affect steelhead adult immigration and holding.

Adult Spawning and Embryo Incubation

Under the No-Project Alternative, minimum instream flows in the LFC would remain at 600 cfs year-round. Flow fluctuations in the LFC that could potentially occur under the No-Project Alternative in order to meet water temperature objectives prescribed by NMFS would be the same as those that occur under Existing Conditions.

Evaluation of the WUA index generated by the PHABSIM model for the adult spawning life stage of steelhead indicated that the maximum amount of spawning area in the LFC, given the current channel configuration, would occur at flows around 500 cfs. Figure C2.4-3 shows the steelhead spawning WUA curve generated by the PHABSIM model for the LFC.

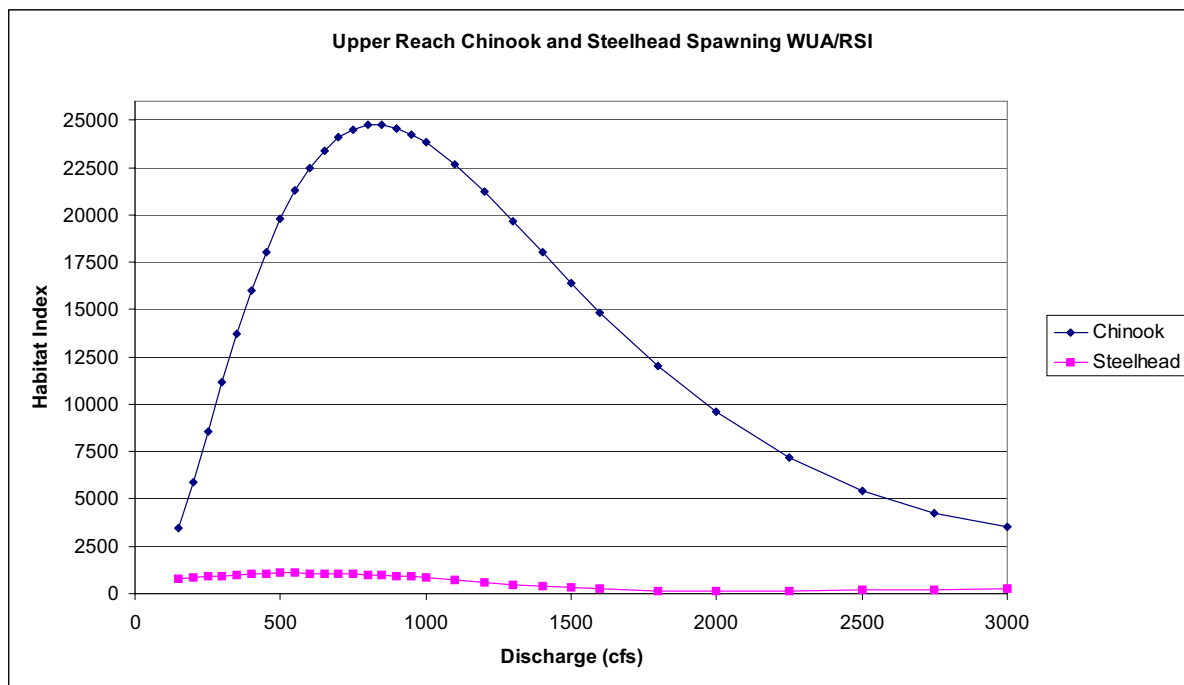


Figure C2.4-3. Low Flow Channel WUA curves for steelhead and Chinook salmon.

Current flows in the LFC during the steelhead spawning period are 600 cfs, which result in approximately 98 percent of maximum WUA. Because proposed flows in the LFC under the No-Project Alternative would be the same as Existing Conditions, flows under the No-Project Alternative also would result in approximately 98 percent of maximum WUA.

Under the No-Project Alternative, flow fluctuations in the HFC are not expected to differ substantially from flow fluctuations that occur under Existing Conditions. Flow releases likely would change seasonally with implementation of the No-Project Alternative, but daily minimum and maximum releases within the steelhead spawning period likely would not differ from Existing Conditions. Current operations maintain flows within the minimum and maximum flows prescribed in the 1983 agreement between DWR and

DFG. According to the USBR (2004), the minimum and maximum flow requirements, as well as the fluctuations permitted during the steelhead spawning and embryo incubation period in the HFC, have not affected this life stage. Therefore, it is expected that the flow requirements and the associated flow fluctuations in the HFC under the No-Project Alternative also would not affect this life stage.

Flood management releases could require release of flows above the maximum flow specified under normal operating conditions, and drought conditions could require flow releases below the minimum flow specified under normal operating conditions. Flood management releases could potentially cause high flow conditions in the HFC, while during drought conditions, flows likely would be lowered to a constant minimum flow of 900 cfs during October, prior to the onset of steelhead spawning, and further lowered to 750 cfs during March, during the steelhead spawning period. Reduction in flows from 900 cfs to 750 cfs during March could potentially affect steelhead spawning in the HFC. Potential effects associated with a reduction in flow could result in redd dewatering or a slight increase in the overall amount of spawning habitat. PHABSIM results indicate that flows of 900 cfs in the HFC would result in approximately 98 percent of maximum WUA while a decrease in flow to 750 cfs would result in approximately 100 percent of maximum WUA.

Evaluation of the WUA index generated by the PHABSIM model for the adult spawning life stage of steelhead indicated that the maximum amount of spawning area in the HFC, given the current channel configuration, would occur at flows around 750 cfs. Figure C2.4-4 shows the WUA curve generated by the PHABSIM model for steelhead spawning in the HFC.

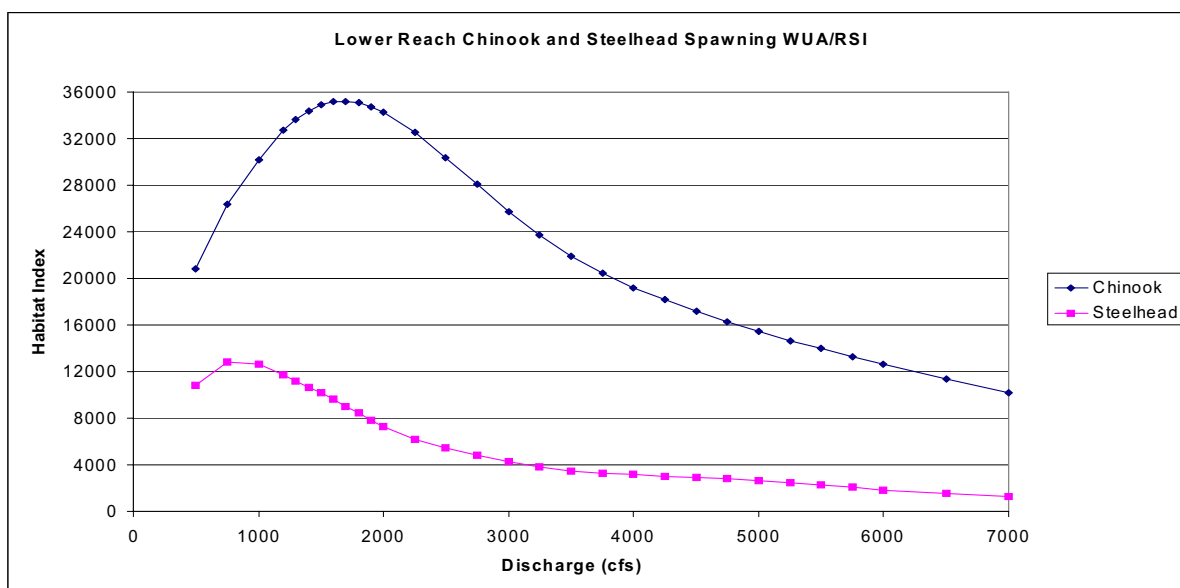


Figure C2.4-4. High Flow Channel WUA curves for steelhead and Chinook salmon.

Current minimum flows in the HFC during the steelhead spawning period are 1,700 cfs, which produce approximately 70 percent of maximum WUA. Average monthly flows under the No-Project Alternative are lower from January through April and from September through December, and are higher from May through August. However, minimum flow requirements are not proposed to differ from Existing Conditions. Therefore, minimum flows in the HFC under the No-Project Alternative also would produce approximately 70 percent of maximum WUA during the steelhead spawning period, representing no change from Existing Conditions.

During extreme drought conditions, total releases from the lower Feather River could be reduced such that releases are no greater than 25 percent of the normal minimum flow requirement below the Thermalito Afterbay Outlet. The 25 percent reduction in flow below normal minimum flows results in a total flow of 750 cfs below the Thermalito Afterbay Outlet from March through September and 900 cfs from October through February. Under the No-Project Alternative, during extreme drought conditions, flow in the LFC would be 600 cfs during the beginning of the steelhead spawning period (December through February), while 300 cfs would be released from the Thermalito Afterbay Outlet. During the remainder of the steelhead spawning period flows in the HFC would be reduced to 750 cfs, 150 cfs of which would come from the Thermalito Afterbay Outlet (i.e., 600 cfs would remain flowing through the LFC). During extreme drought conditions, flow reductions from 900 cfs to 750 cfs in the HFC could affect spawning adult steelhead by creating the opportunity for redd dewatering during the flow reduction. Additionally, PHABSIM model results indicate that a reduction in flow in the HFC from 900 cfs to 750 cfs would increase available spawning habitat from approximately 98 percent of maximum WUA to almost 100 percent of maximum WUA.

Based on modeling results conducted as part of the PDEA, mean monthly flows under the No-Project Alternative during the steelhead spawning period would be lower in the HFC than under Existing Conditions. Changes in mean monthly flows during the steelhead spawning period would result in changes in spawning WUA. Due to the generalized nature of the WUA index and the inherent limitations in the methodology associated with Instream Flow Incremental Methodology (IFIM) and PHABSIM models, small changes in flow at the flows modeled were not able to determine exact changes in WUA. However, examination of Figure C2.4-4 shows that, from December through March, slight decreases in flow would result in slight increases in WUA compared to Existing Conditions. Overall, the average monthly changes in flow under the No-Project Alternative would result in an increase in spawning WUA over the course of the spawning period compared to Existing Conditions.

Fry and Fingerling Rearing and Downstream Movement

Under the No-Project Alternative, flow fluctuations in the HFC would be similar to those occurring under Existing Conditions. Because flow fluctuations under Existing Conditions have no effect on steelhead fry and fingerling downstream movement, it is expected that flow fluctuations occurring under the No-Project Alternative also would have no effect on this life stage.

Smolt Emigration

Under the No-Project Alternative, flow fluctuations in the HFC would be similar to those occurring under Existing Conditions. Because flow fluctuations that could potentially occur under the No-Project Alternative would be similar to flow fluctuations that occur under Existing Conditions, implementation of the No-Project Alternative is not expected to result in a change in the rate of juvenile stranding resulting from flow fluctuations.

C2.4.3.2 Water Temperature–Related Effects

Effects of water temperature changes associated with the No-Project Alternative are expressed in the qualitative analyses of relative habitat suitability presented below.

Adult Immigration and Holding

No changes in water temperatures are anticipated in the LFC with implementation of the No-Project Alternative. Modeling conducted as part of the PDEA showed slight decreases in water temperature in the HFC associated with the No-Action Alternative and, as such, slightly lower water temperatures in the HFC are anticipated with implementation of the No-Project Alternative. Increased habitat suitability due to decreased water temperatures under the No-Project Alternative would provide a slight beneficial effect on steelhead adult immigration and holding.

Adult Spawning and Embryo Incubation

Under the No-Project Alternative flows and water temperatures in the LFC, where most steelhead spawning occurs, are not anticipated to differ from Existing Conditions. Flows in the HFC may change slightly as demand patterns for water supply shift in future years (see Section 5.2.1, Surface Water Quantity). However, the analysis of habitat suitability under the No-Action Alternative in the PDEA indicated less than a one percent difference in spawning habitat suitability between Existing Conditions and the No-Action Alternative. Therefore, operation of the Oroville Facilities under the No-Project Alternative would result in no changes to steelhead spawning and embryo incubation due to changes in water temperature.

Fry and Fingerling Rearing and Downstream Movement

In the analyses conducted as part of the PDEA, differences in habitat suitability due to decreased water temperatures during the steelhead fry and fingerling downstream movement life stage period are less than one percent between Existing Conditions and the No-Action Alternative. Therefore, changes in water temperature would not affect steelhead fry and fingerling rearing and downstream movement.

Smolt Emigration

The analysis of water temperature effects on steelhead smolt emigration conducted as part of the PDEA between Existing Conditions and the No-Action Alternative showed a slight beneficial effect because water temperatures were slightly reduced during the

smolt emigration life stage. It is anticipated that implementation of the No-Project Alternative would alter water temperatures similarly and result in the same slight benefits on steelhead smolt emigration.

C2.4.3.3 Predation-Related Effects

The slight changes in water temperature resulting from slight changes in seasonal flow patterns in the HFC under the No-Project Alternative are not anticipated to affect predation rates or the composition of predator species.

C2.4.3.4 Fisheries Management-Related Effects

Hatchery

No changes to hatchery management practices are anticipated under the No-Project Alternative. Therefore, no hatchery-related effects on steelhead are expected.

Disease

The slight changes in water temperature resulting from slight changes in seasonal flow patterns in the HFC under the No-Project Alternative are not anticipated to affect the incidence of disease associated with steelhead.

Fishing Regulations, Poaching, and Change in Recreational Access and Visitation

As described in Section 5.7 of the DEIR, Recreational Resources, a one-third increase in recreation and angling activities is anticipated with implementation of the No-Project Alternative. A one-third increase in angling with no other fisheries changes would result in increased sport fish harvest rates. No changes to fishing regulations are anticipated to occur under the No-Project Alternative. Therefore, a negative effect on the steelhead natural spawning population could occur.

C2.4.3.5 Summary of Potential Effects on Steelhead

Adult Immigration and Holding

Changes in mean monthly flows under the No-Project Alternative would have no effect on steelhead adult immigration and holding. Analyses conducted as part of the PDEA showed differences in habitat suitability due to decreased water temperatures are less than one percent between Existing Conditions and the No-Project Alternative.

Therefore, changes in water temperature would not affect steelhead adult immigration and holding. Increased angling and sport harvest could have an adverse effect on steelhead adult immigration and holding.

Overall, operation of the Oroville Facilities under the No-Project Alternative would result in a slight adverse effect on steelhead immigration and holding.

Adult Spawning and Embryo Incubation

Mean monthly flow changes associated with implementation of the No-Project Alternative, compared to Existing Conditions, would result in increased WUA, thereby providing a slight beneficial effect on this life stage. Differences in habitat suitability due to decreased water temperatures during the steelhead adult spawning and embryo incubation period would likely be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect steelhead adult spawning and embryo incubation. However, continued degradation of spawning gravel quality in the lower Feather River would result in an adverse effect on steelhead adult spawning and embryo incubation by reducing the quality and quantity of available habitat.

Overall, operation of the Oroville Facilities under the No-Project Alternative would result in an adverse effect on steelhead adult spawning and embryo incubation.

Fry and Fingerling Rearing and Downstream Movement

Changes in flows under the No-Project Alternative would have no effect on steelhead fry and fingerling rearing and downstream movement. Differences in habitat suitability due to decreased water temperatures likely would be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect steelhead juvenile rearing and downstream movement. However, continued degradation of LWD, gravel, and side-channel habitat quality would result in an adverse effect on rearing and downstream movement.

Overall, operation of the Oroville Facilities under the No-Project Alternative would result in an adverse effect on steelhead fry and fingerling rearing and downstream movement.

Smolt Emigration

Changes in mean monthly flows under the No-Project Alternative would have no effect on steelhead smolt emigration. Differences in habitat suitability due to decreased water temperatures likely would provide a slight benefit under the No-Project Alternative relative to Existing Conditions.

Overall, operation of the Oroville Facilities under the No-Project Alternative likely would result in a slightly beneficial effect on steelhead smolt emigration.

Conclusions

Based on the above summary of potential effects, it is likely that the No-Project Alternative would have an overall adverse effect on steelhead, relative to Existing Conditions.

C2.4.4 American Shad

C2.4.4.1 Flow-Related Effects

No flow changes are anticipated to occur in the LFC under the No-Project Alternative relative to Existing Conditions. Slight changes in mean monthly flow during the American shad adult immigration and spawning period in the HFC would have no effect on American shad spawning, primarily because shad are broadcast spawners and fertilized eggs drift downstream with the current.

C2.4.4.2 Water Temperature–Related Effects

No water temperature changes are anticipated to occur in the LFC under the No-Project Alternative. Slight water temperature changes are anticipated to occur in the HFC as a result of increasing demand for water supply. However, analysis in the PDEA associated with implementation of the No-Action Alternative indicated that habitat suitability would change less than one percent as a result of changes in water temperatures. Additionally, because American shad appear to tolerate a broad range of water temperatures for spawning (between 46 and 79°F (Painter et al. 1979; Wang 1986)), water temperature changes likely to occur in the HFC would be too small to affect American shad spawning and adult immigration.

C2.4.4.3 Summary of Potential Effects on American Shad

Study plan report summaries addressing project effects on American shad are presented in Section G-AQUA1.4, Non-Salmonid Fish in the Feather River Downstream of the Thermalito Diversion Dam, in Appendix G-AQUA1 of the PDEA.

No flow or water temperature–related effects are expected to occur in the LFC under the No-Project Alternative. Flow changes in the HFC are not anticipated to alter river stage substantially over potential passage barriers in the lower Feather River, thereby having no effect on American shad adult immigration and spawning. Differences in habitat suitability due to water temperature changes would likely be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect American shad adult spawning.

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have no effect on American shad adult immigration and spawning, relative to Existing Conditions.

C2.4.5 Black Bass

C2.4.5.1 Water Temperature–Related Effects

No water temperature changes are anticipated to occur in the LFC under the No-Project Alternative. Water temperatures downstream of the Thermalito Afterbay Outlet may decrease slightly under the No-Project Alternative, which could have a slight negative effect on Black bass in the upper reaches of the lower Feather River. However,

modeling conducted as part of the PDEA showed less than a one percent change in black bass habitat suitability.

C2.4.5.2 Summary of Potential Effects on Black Bass

Study plan report summaries addressing project effects on black bass species are presented in Section G-AQUA1.4, Non-Salmonid Fish in the Feather River Downstream of the Thermalito Diversion Dam; Section G-AQUA1.5, Fisheries Management; and Section G-AQUA1.11, Predation, in Appendix G-AQUA1 of the PDEA.

Differences in habitat suitability due to water temperature changes likely would be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect black bass adult spawning.

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have no effect on black bass.

C2.4.6 Green Sturgeon

Study plan report summaries addressing project effects on green sturgeon are presented in Section G-AQUA1.4, Non-Salmonid Fish in the Feather River Downstream of the Thermalito Diversion Dam, in Appendix G-AQUA1 of the PDEA.

C2.4.6.1 Flow-Related Effects

No flow changes are anticipated to occur in the LFC under the No-Project Alternative. Changes in mean monthly flows in the HFC under the No-Project Alternative compared to Existing Conditions are anticipated to result in no effect on green sturgeon adult immigration and holding, adult spawning and embryo incubation, juvenile rearing, and juvenile emigration because the changes in river stage associated with changes in flows would be small. Because analytical tools such as PHABSIM were not available for use on this species, this assessment is based on a qualitative analysis.

C2.4.6.2 Water Temperature-Related Effects

No water temperature changes are anticipated to occur in the LFC. Small changes in water temperature may occur under the No-Project Alternative downstream of the Thermalito Afterbay Outlet where most sturgeon are observed.

Adult Immigration and Holding

Modeling conducted as part of the PDEA showed very small changes in water temperature in the HFC associated with the No-Action Alternative. However, changes in water temperature resulted in a less than one percent change in suitable habitat for this life stage. These changes are not expected to affect the green sturgeon adult immigration and holding life stage under the No-Project Alternative.

Adult Spawning and Embryo Incubation

Based on modeling conducted as part of the PDEA, differences in habitat suitability due to slightly lower water temperatures in the HFC between Existing Conditions and the No-Project Alternative indicate that habitat suitability would increase by approximately one percent under the No-Project Alternative. Therefore, changes in water temperature would provide a slight beneficial effect on green sturgeon adult spawning and embryo incubation.

Juvenile Rearing

Based on modeling conducted as part of the PDEA, differences in habitat suitability due to decreased water temperatures would be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect green sturgeon juvenile rearing.

Juvenile Emigration

Based on modeling conducted as part of the PDEA, differences in habitat suitability due to differences in water temperature between Existing Conditions and the No-Project Alternative indicate that habitat suitability would increase by approximately two percent under the No-Project Alternative. Therefore, changes in water temperature would provide a slight beneficial effect on green sturgeon juvenile emigration.

C2.4.6.3 Summary of Potential Effects on Green Sturgeon

No flow or water temperature–related effects are expected to occur in the LFC.

Adult Immigration and Holding

Flow changes in the HFC are not anticipated to appreciably change river stage over potential passage barriers in the lower Feather River below the Thermalito Afterbay Outlet, thereby having no effect on green sturgeon adult immigration and holding. Differences in habitat suitability due to decreased water temperatures are less than one percent between Existing Conditions and the No-Project Alternative.. Therefore, changes in water temperature would not affect green sturgeon adult immigration and holding.

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have no effect on green sturgeon adult immigration and holding.

Adult Spawning and Embryo Incubation

Flow changes in the HFC are not anticipated to appreciably change river stage in the lower Feather River below the Thermalito Afterbay Outlet, thereby having no effect on green sturgeon adult spawning and embryo incubation. Differences in habitat suitability due to differences in water temperature between Existing Conditions and the No-Project Alternative indicate that habitat suitability would increase by approximately one percent

under the No-Project Alternative. Therefore, changes in water temperature would provide a slight beneficial effect on green sturgeon adult spawning and embryo incubation.

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have a slight beneficial effect on green sturgeon adult spawning and embryo incubation.

Juvenile Rearing

Flow changes in the HFC are not anticipated to affect green sturgeon juvenile rearing because associated changes in river stage likely would result in very small changes in available rearing habitat area. Differences in habitat suitability due to decreased water temperatures are less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect green sturgeon juvenile rearing.

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have no effect on green sturgeon juvenile rearing.

Juvenile Emigration

Flow changes in the HFC are not anticipated to affect green sturgeon juvenile emigration because associated changes in river stage likely would result in very small changes in available habitat area. Differences in habitat suitability due to differences in water temperature between Existing Conditions and the No-Project Alternative indicate that habitat suitability would increase by approximately two percent under the No-Project Alternative. Therefore, changes in water temperature would provide a slight beneficial effect on green sturgeon juvenile emigration.

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have a slight beneficial effect on green sturgeon juvenile emigration.

Conclusion

Based on the above summary of potential effects, it is likely that the No-Project Alternative would have an overall slight beneficial effect on green sturgeon, relative to Existing Conditions.

C2.4.7 Hardhead

C2.4.7.1 Water Temperature–Related Effects

No water temperature changes are anticipated to occur in the LFC. Small changes in water temperature may occur under the No-Project Alternative downstream of the Thermalito Afterbay Outlet.

Based on modeling conducted as part of the PDEA, differences in habitat suitability due to water temperature changes are less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature in the HFC would not affect hardhead spawning.

C2.4.7.2 Summary of Potential Effects on Hardhead

Study plan report summaries addressing project effects on hardhead are presented in Section G-AQUA1.4, Non-Salmonid Fish in the Feather River Downstream of the Thermalito Diversion Dam, in Appendix G-AQUA1 of the PDEA.

Differences in habitat suitability due to water temperature changes would be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect hardhead spawning.

Conclusion

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have no effect on hardhead, relative to Existing Conditions.

C2.4.8 River Lamprey

C2.4.8.1 Water Temperature–Related Effects

No water temperature changes are anticipated to occur in the LFC. Small changes in water temperature may occur under the No-Project Alternative downstream of the Thermalito Afterbay Outlet.

Based on modeling conducted as part of the PDEA, differences in habitat suitability due to water temperature changes would be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect river lamprey spawning.

C2.4.8.2 Summary of Potential Effects on River Lamprey

Study plan report summaries addressing project effects on river lamprey are presented in Section G-AQUA1.4, Non-Salmonid Fish in the Feather River Downstream of the Thermalito Diversion Dam, in Appendix G-AQUA1 of the PDEA.

Differences in habitat suitability due to water temperature changes are less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect river lamprey spawning. However, continued degradation of spawning gravel quality in the lower Feather River would result in a slightly adverse effect on river lamprey adult spawning by reducing the quality and quantity of available habitat.

Conclusion

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have a slightly adverse effect on river lamprey, relative to Existing Conditions.

C2.4.9 Sacramento Splittail

C2.4.9.1 Flow-Related Effects

No flow changes are anticipated to occur in the LFC. Downstream of the Thermalito Afterbay Outlet, mean monthly flow changes during the Sacramento splittail spawning period would not be of sufficient magnitude to result in any change in useable flooded area for Sacramento splittail spawning. Therefore, mean monthly flow changes under the No-Project Alternative would have no effect on Sacramento splittail spawning.

C2.4.9.2 Water Temperature–Related Effects

No water temperature changes are anticipated to occur in the LFC. Small changes in water temperature may occur under the No-Project Alternative downstream of the Thermalito Afterbay Outlet.

Based on modeling conducted as part of the PDEA, differences in habitat suitability due to water temperature changes would be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect Sacramento splittail spawning.

C2.4.9.3 Summary of Potential Effects on Sacramento Splittail

Study plan report summaries addressing project effects on Sacramento splittail are presented in Section G-AQUA1.4, Non-Salmonid Fish in the Feather River Downstream of the Thermalito Diversion Dam, in Appendix G-AQUA1 of the PDEA.

No flow or water temperature–related effects are expected to occur in the LFC. Flow changes in the HFC are not anticipated to decrease river stage appreciably over potential spawning benches in the lower Feather River, thereby having no effect on Sacramento splittail adult spawning. Differences in habitat suitability due to water temperature changes would be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect Sacramento splittail adult spawning.

Conclusion

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have a no effect on Sacramento splittail, relative to Existing Conditions.

C2.4.10 Striped Bass

C2.4.10.1 Flow-Related Effects

No flow changes are anticipated to occur in the LFC. Mean monthly flow changes in the HFC during the striped bass adult spawning period are not expected to appreciably change river stage. Therefore, mean monthly flow changes under the No-Project Alternative would have no effect on striped bass spawning.

C2.4.10.2 Water Temperature-Related Effects

No water temperature changes are anticipated to occur in the LFC. Small changes in water temperature may occur under the No-Project Alternative downstream of the Thermalito Afterbay Outlet.

Based on modeling conducted as part of the PDEA, differences in habitat suitability due to water temperature changes would be less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect striped bass spawning.

C2.4.10.3 Summary of Potential Effects on Striped Bass

Study plan report summaries addressing project effects on striped bass are presented in Section G-AQUA1.4, Non-Salmonid Fish in the Feather River Downstream of the Thermalito Diversion Dam, in Appendix G-AQUA1 of the PDEA.

No flow or water temperature-related effects are expected to occur in the LFC. Flow changes in the HFC are not anticipated to appreciably alter river stage in the lower Feather River, thereby having no effect on striped bass spawning. Differences in habitat suitability due to water temperature changes are less than one percent between Existing Conditions and the No-Project Alternative. Therefore, changes in water temperature would not affect striped bass spawning.

Conclusion

Overall, operation of the Oroville Facilities under the No-Project Alternative is anticipated to have a no effect on striped bass, relative to Existing Conditions.

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